

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

TRIPOLI, Joseph, S.
Thomson Multimedia Licensing
Incorporated
P.O. Box 5312
Princeton, NJ 08540
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 18 August 2000 (18.08.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference RCA89181	
International application No. PCT/US99/19700	International filing date (day/month/year) 31 August 1999 (31.08.99)

1. The following indications appeared on record concerning: <input checked="" type="checkbox"/> the applicant <input type="checkbox"/> the inventor <input type="checkbox"/> the agent <input type="checkbox"/> the common representative		
Name and Address THOMSON CONSUMER ELECTRONICS, INC. 10330 North Meridian Street Indianapolis, IN 46290-1024 United States of America	State of Nationality US	State of Residence US
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning: <input type="checkbox"/> the person <input checked="" type="checkbox"/> the name <input checked="" type="checkbox"/> the address <input checked="" type="checkbox"/> the nationality <input checked="" type="checkbox"/> the residence		
Name and Address THOMSON LICENSING S.A. 46, Quai A. Le Galo F-92648 Boulogne Cedex France	State of Nationality FR	State of Residence FR
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
3. Further observations, if necessary: Please note that the agent's post code has been amended accordingly.		
4. A copy of this notification has been sent to: <input checked="" type="checkbox"/> the receiving Office <input type="checkbox"/> the designated Offices concerned <input type="checkbox"/> the International Searching Authority <input checked="" type="checkbox"/> the elected Offices concerned <input type="checkbox"/> the International Preliminary Examining Authority <input type="checkbox"/> other:		

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer A. Karkachi Telephone No.: (41-22) 338.83.38
--	--

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year): 18 May 2000 (18.05.00)	
International application No. PCT/US99/19700	Applicant's or agent's file reference RCA89181
International filing date (day/month/year) 31 August 1999 (31.08.99)	Priority date (day/month/year) 31 August 1998 (31.08.98)
Applicant ESKICIOGLU, Ahmet, Mursuit et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
30 March 2000 (30.03.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer C. Villet Telephone No.: (41-22) 338.83.38
--	--

MAY 26 2000

IS&S

PCT

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

TRIPOLI, J.
THOMSON MULTIMEDIA LICENSING INC.
P.O. Box 5312
Princeton, New Jersey 08543
ETATS-UNIS D'AMERIQUE

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing
(day/month/year) 19.05.2000

Applicant's or agent's file reference
RCA89181

IMPORTANT NOTIFICATION

International application No.
PCT/US99/19700

International filing date (day/month/year)
31/08/1999

Priority date (day/month/year)
31/08/1998

Applicant
THOMSON CONSUMER ELECTRONICS, INC. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

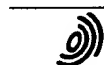
4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

B. Stannartz

Tel. +49 89 2399-




PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference RCA89181	FOR FURTHER ACTION		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US99/19700	International filing date (<i>day/month/year</i>) 31/08/1999	Priority date (<i>day/month/year</i>) 31/08/1998	
International Patent Classification (IPC) or national classification and IPC H04N5/913			
Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application 			
Date of submission of the demand 30/03/2000		Date of completion of this report 19.05.2000	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer Loeser, E Telephone No. +49 89 2399 8482	



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/19700

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-12 as originally filed

Claims, No.:

1-20 as originally filed

Drawings, sheets:

1-3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/19700

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-20
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-20
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/19700

1. Concerning Section V - Articles 33(2) and 33(3) PCT

The following documents are cited:

- D1: EP-A-0 912 952;
- D2: EP-A-0 763 936;
- D3: EP-A-0 714 204;
- D4: EP-A-0 858 184;
- D5: FR-A-2 732 537.

D1 discloses recording of encrypted digital data, wherein scrambled data accompanied by an encrypted control word is received, the control word is decrypted and re-encrypted to a different control word.

In the context of digital video recording, D2 (Figs. 10, 11 and related text passages) discloses reception of scrambled data accompanied by encrypted control information, decrypting and modifying the control information, and re-encrypting the modified control information.

In the same context, D3 (abstract) discloses reception of a scrambled bitstream accompanied by an encrypted keystream, wherein in a recording mode the keystream is accordingly modified and recorded in an encrypted format mixed with the bitstream.

D4 (abstract) discloses replacing an entitlement control message (ECM) received along with scrambled digital data with a transformed entitlement control message.

D5 also discloses re-encrypting control information received along with digital video data.

2.1. Claim 1

None of the presently available documents appears to disclose

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/19700

features (b) and (c) of claim 1 on file, which features pertain to attaching a data item indicative of a copy status of a program to a received encrypted control component, whereafter encryption is applied to the encrypted control component with the data item attached to generate a nested control component. Accordingly, claim 1 meets the requirements of novelty and inventive step set out in Articles 33(2) and 33(3) PCT.

2.2. Claims 12, 20

Claims 12 and 20 provide the inverse of the method defined in claim 1 and thus are linked to the novel and inventive concept of claim 1. Accordingly, claims 12 and 20 meet the requirements of novelty and inventive step set out in Articles 33(2) and 33(3) PCT.

3. Concerning Section VII: Description and formal belongings

a)

The additional subject-matter provided by claims 8 and 19 pertains to features of an apparatus rather than to method steps. Accordingly, doubt is cast upon the claims' intended scope of protection, contrary to the requirements set out in Art. 6 PCT.

b)

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 to D5 identified above is not mentioned in the description, nor are these documents identified therein.

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference RCA89181	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 99/ 19700	International filing date (day/month/year) 31/08/1999	(Earliest) Priority Date (day/month/year) 31/08/1998
Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

2b, c

☐ None of the figures.

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : H04N 5/913, 7/167, 7/24		A1	(11) International Publication Number: WO 00/13412
			(43) International Publication Date: 9 March 2000 (09.03.00)
(21) International Application Number: PCT/US99/19700		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 31 August 1999 (31.08.99)			
(30) Priority Data: 60/098,501 31 August 1998 (31.08.98) US			
(71) Applicant (for all designated States except US): THOMSON CONSUMER ELECTRONICS, INC. [US/US]; 10330 North Meridian Street, Indianapolis, IN 46290-1024 (US).			
(72) Inventors; and (75) Inventors/Applicants (for US only): ESKICIOGLU, Ahmet, Mursuit [TR/US]; Apartment 125, 8235 Lakeshore Trail, Indianapolis, IN 46250 (US). BEYERS, William, Wesley, Jr. [US/US]; 1075 Arrow Wood Drive, Carmel, IN 46033-9046 (US).			
(74) Agents: TRIPOLI, Joseph, S. et al.; Thomson Multimedia Licensing Incorporated, P.O. Box 5312, Princeton, NJ 08543 (US).			

Published

With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: A COPY PROTECTION SYSTEM FOR HOME NETWORKS

Control Word (CW) or Descrambling Key	Access Conditions
--	----------------------

ECM

Control Word (CW) Or Descrambling Key	Access Conditions including Copy Control Information	Data Item or Mark
--	---	----------------------

Encrypted ECM

Nested & Encrypted ECM

CW or Key	Access Conditions including CCI	Data Item or Mark (X ₀)	Constant; f(x _i) for i>0
--------------	------------------------------------	--	--------------------------------------

Encrypted using K

XECM

(57) Abstract

A method for managing a global copy protection system for home networks is provided. Particularly, the defined method protects copyrighted digital content from unauthorized copying as it is transmitted across digital interfaces, provided a practical way of creating legitimate copies of broadcast and prerecorded content, and prevents illegitimate copies from being viewed.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

INTERNATIONAL SEARCH REPORT

Internat. Application No.

PCT/US 99/19700

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04N5/913 H04N7/167 H04N7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	EP 0 912 052 A (CANAL PLUS SA) 28 April 1999 (1999-04-28) the whole document	1-20
X	EP 0 763 936 A (LG ELECTRONICS INC) 19 March 1997 (1997-03-19) the whole document	1-20
X	EP 0 714 204 A (LG ELECTRONICS INC) 29 May 1996 (1996-05-29) the whole document	1-20
A	WO 97 25816 A (SONY CORP ; INOUE HAJIME (US); LEE CHUEN CHIEN (US); SONY ELECTRONI) 17 July 1997 (1997-07-17) the whole document	1, 12
	-/-	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

11 February 2000

Date of mailing of the international search report

18/02/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Giannotti, P

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US 99/19700

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>"FUNCTIONAL MODEL OF A CONDITIONAL ACCESS SYSTEM"</p> <p>EBU REVIEW- TECHNICAL, BE, EUROPEAN BROADCASTING UNION. BRUSSELS, no. 266, 21 December 1995 (1995-12-21), pages 64-77, XP000559450</p> <p>ISSN: 0251-0936</p>	
A	<p>EP 0 858 184 A (NDS LTD)</p> <p>12 August 1998 (1998-08-12)</p>	
A	<p>FR 2 732 537 A (CANAL PLUS SA)</p> <p>4 October 1996 (1996-10-04)</p>	
A	<p>EP 0 860 823 A (TOKYO SHIBAURA ELECTRIC CO)</p> <p>26 August 1998 (1998-08-26)</p>	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/19700

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0912052	A	28-04-1999	AU	9092698 A	12-04-1999
			WO	9916244 A	01-04-1999
EP 0763936	A	19-03-1997	CN	1150738 A	28-05-1997
			JP	9093561 A	04-04-1997
			US	5799081 A	25-08-1998
EP 0714204	A	29-05-1996	CN	1137723 A	11-12-1996
			JP	8242438 A	17-09-1996
			US	5757909 A	26-05-1998
WO 9725816	A	17-07-1997	AU	1344097 A	01-08-1997
			CN	1209247 A	24-02-1999
			EP	0882357 A	09-12-1998
			US	5889919 A	30-03-1999
EP 0858184	A	12-08-1998	GB	2322030 A, B	12-08-1998
FR 2732537	A	04-10-1996	NONE		
EP 0860823	A	26-08-1998	US	5987126 A	16-11-1999
			WO	9802881 A	22-01-1998

091763773

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
9 March 2000 (09.03.2000)

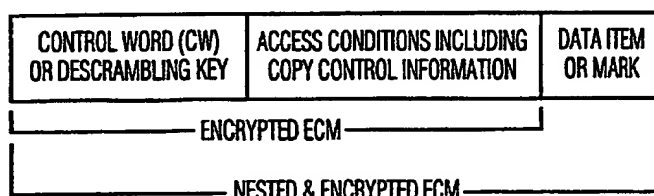
PCT

(10) International Publication Number
WO 00/13412 A1

- (51) International Patent Classification⁷: H04N 5/913, 7/167, 7/24 Wesley, Jr. [US/US]; 1075 Arrow Wood Drive, Carmel, IN 46033-9046 (US).
- (21) International Application Number: PCT/US99/19700 (74) Agents: TRIPOLI, Joseph, S. et al.; Thomson Multimedia Licensing Incorporated, P.O. Box 5312, Princeton, NJ 08540 (US).
- (22) International Filing Date: 31 August 1999 (31.08.1999)
- (25) Filing Language: English (81) Designated States (*national*): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (26) Publication Language: English (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- (30) Priority Data: 60/098,501 31 August 1998 (31.08.1998) US
- (71) Applicant (*for all designated States except US*): THOMSON LICENSING S.A. [FR/FR]; 46, Quai A. Le Galo, F-92648 Boulogne Cedex (FR).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): ESKICIOGLU, Ahmet, Mursuit [TR/US]; Apartment 125, 8235 Lakeshore Trail, Indianapolis, IN 46250 (US). BEYERS, William,

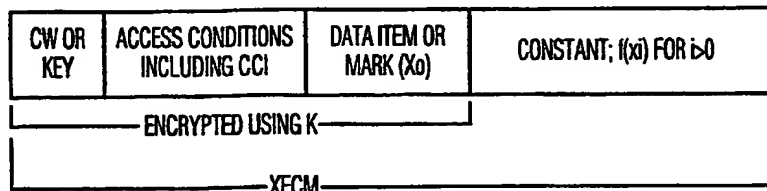
[Continued on next page]

(54) Title: A COPY PROTECTION SYSTEM FOR HOME NETWORKS



B

RECEIVED
JUL 11 2001
Technology Center 2600



C

(57) Abstract: A method for managing a global copy protection system for home networks is provided. Particularly, the defined method protects copyrighted digital content from unauthorized copying as it is transmitted across digital interfaces, provided a practical way of creating legitimate copies of broadcast and prerecorded content, and prevents illegitimate copies from being viewed.

WO 00/13412 A1



Published:

— *With international search report.*

(15) Information about Correction:

see PCT Gazette No. 25/2001 of 21 June 2001, Section II

(48) Date of publication of this corrected version:

21 June 2001

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A COPY PROTECTION SYSTEM FOR HOME NETWORKS

Field of the Invention

5 This invention concerns a system that may be used to manage access to a copy of a scrambled digital stream, such as a program or event. The scrambled digital stream is not descrambled until it is determined that the copy of the program is legitimate.

Background of the Invention

10 Today's NTSC televisions receive broadcast services from a variety of service providers. Some television receivers are capable of receiving unscrambled information or programs from broadcast, satellite and cable
15 networks. Traditionally, cable networks or digital satellite systems providing scrambled or encrypted programs usually require a separate stand-alone device (e.g., a set-top box) to descramble or decrypt the program. These set-top boxes may utilize a removable smart card which contain the necessary decrypting algorithms and keys.

20 In the near future, digital televisions (DTVs) and digital set-top boxes (STBs) will be capable of receiving digital broadcast, cable and satellite services. Therefore, the protection of digital video and audio content has become one of the major issues for the Information Technology (IT), Consumer
25 Electronics (CE) and Motion Picture (MP) industries. Analog services can be protected reasonably well using a signal distortion mechanism. As a similar solution is not possible for digital content, a new approach for delivering digital audio and video content with adequate protection against illegal duplication is needed.

Summary of the Invention

30 The present invention resides, in part, in recognition of the described problem and, in part, in providing a solution to this problem. A method
35 is described for preventing the use of unauthorized copies of digital content (e.g., movies, etc.). The content, presented in MPEG-2 Transport Stream format, is scrambled using a common algorithm before release. The scrambling keys and other data are included in the Entitlement Control Messages (ECMs) that may be encrypted with the public key of a renewable security device (for example, a
40 removable smart card). The other data includes the price and source (broadcast

or pre-recorded) of the content (or program) and Copy Control Information (CCI). Before recording a program, the recording device, connected to the home network, first checks if the program is scrambled. If scrambled content is detected, the recorder attaches a "copy-mark" or "data item" to each ECM in the new copy and encrypts them with the public key. The data item indicates that the restricted program (actually, that the audio/video component) has been copied. In general, every time a scrambled content is copied, its ECMs are encrypted once again. This process, called ECM nesting, allows the renewable security device coupled to the display unit (e.g., Digital TV) to distinguish between legitimate and illegitimate copies.

An event or program as described herein comprises one of the following: (1) audio/visual data such as a movie, weekly "television" show or a documentary; (2) textual data such as an electronic magazine, paper, or weather news; (3) computer software; (4) binary data such as images or (5) HTML data (e.g., web pages). A service provider may comprise any provider of an event or program, for example, traditional broadcast television networks, cable networks, digital satellite networks, providers of electronic list of events, such as electronic program guide providers, and in certain cases internet service providers.

A system in accordance with the present invention may utilize public key technology. Typically, such a system utilizes one public key (corresponding to a smart card) for all service providers. Each smart card has stored therein a secret private key that can decrypt messages encrypted by the public key. The service provider sends a conditional access (CA) entitlement message (i.e., an Entitlement Control Message or ECM) in the bit stream encrypted by the public key that may contain the name of the service provider, and the name, time, and cost of the program. This message is decrypted by the smart card, and the appropriate information is stored therein. In one embodiment, the smart card may have a certain amount of credit for purchases that has been enabled by a bank or from a service provider. As long as the limit is not exceeded, services can be purchased by the user. At some appropriate preprogrammed time, the smart card causes the device (e.g., set-top box) to automatically place a telephone call to the CA center. Using a secure channel, the CA center in cooperation with a bank receives billing information from the smart card and provides additional credit. The bank forwards the information and credits the appropriate service provider.

Generally, the present invention defines a method for managing access (i.e., viewing) to a copy of a restricted (or scrambled) broadcast or

transmitted program. In accordance with one aspect of the present invention, a method for copying a program having a scrambled program content component (for example, an audio/video program) and an encrypted control component (e.g., ECM) is defined. The method comprises receiving the program in a recording
5 apparatus, and attaching a data item to the encrypted control component. The data item is used to indicate that the program has been copied. Finally, the encrypted control component and the data item together are encrypted to generate a nested control component.

10 In accordance with another aspect of the present invention, a method for managing access to a copy of a restricted program comprises receiving the restricted program in a processing apparatus. The nested control component is decrypted to obtain the encrypted control component and the data item. The encrypted control component is then decrypted to obtain a
15 descrambling key and copy control information. The data item and the copy control information is compared to determine if the copy is authorized (or valid) and, if authorized, the program content component is descrambled using the descrambling key.

20 In accordance with yet another aspect of the present invention, the method for managing access to the recorded copy of a restricted program employs a smart card coupled to a video processing apparatus. Particularly, the method comprises transferring a cash reserve and entitlements to the smart card, receiving the recorded copy of the restricted program in the smart card, obtaining
25 a descrambling key, copy control information and purchase information, comparing the copy control information and the data item to determine if said copy is authorized and verifying that the cost of the restricted program is less than the stored cash reserve. The cost of the restricted program is then deducted from the stored cash reserve, and the audio/video component is descrambled using
30 the descrambling key. It is within the scope of the invention to substitute a "time model" for the "cost model", that is, the amount of time that a program is authorized to be viewed may be controlled.

35 These and other aspects of the invention will be explained with reference to a preferred embodiment of the invention shown in the accompanying Drawings.

Brief Description of the Drawing

Figure 1 is a block diagram illustrating a home network comprised of various digital devices that may receive scrambled content from a plurality of sources;

Figure 2a is a diagram defining a typical entitlement control message (ECM);

Figure 2b is a diagram defining a nested ECM in accordance with one embodiment of the present invention;

Figure 2c is a diagram defining an Extended ECM in accordance with another embodiment of the present invention; and

Figure 3 is a block diagram illustrating a typical home network employing the present invention.

Detailed Description of the Drawing

The present invention provides a conditional access system, which may be utilized to manage access to copies of restricted programs, for example, scrambled (or encrypted) programs. A conditional access system may be integrated into a renewable security device, such as a smart card complying to the National Renewable Security Standard (NRSS), EIA-679 Part A or Part B. The conditional access system, when implemented within a digital television (DTV), set-top box (STB), or the like, permits a user to view only legitimate copies of the scrambled program. The functionality of the smart card may be embedded within the DTV or STB.

A Certificate Authority (not shown) issues digital certificates and public and private key pairs, which are used as explained below. It is within the scope of this invention that the role of the certificate authority may be performed by the service providers in collaboration with the manufacturers of the devices. A billing center may be utilized to manage the user's accounts; updated information is provided as users make arrangements to purchase additional services and as these services are consumed or used.

Broadcasters are responsible for delivering: (1) the services, and (2) the entitlement messages (entitlement control messages) that allow any user to

buy those services. The broadcast channel is used only to deliver the services and information for access to these services. All the remaining transactions are carried out using a return channel (i.e., a modem and a phone connection or a cable modem). The present conditional access system may be based on E-cash card loading. A user pre-loads his/her card with a certain amount of cash (from debit or credit accounts), and then uses the card to buy services as described below.

If a return channel connection is not available to communicate with the CA server, then loading cash to the card requires the user to either access a device with back-channel support or go to a particular location (bank, ATM, vendor's regional office) to have the card loaded. The CA operators act like the card holder's or user's bank, while the billing center acts like the merchant's bank. The fixed amount of "cash" loaded into the renewable security device, for example, a removable smart card or conditional access module, can now be used to pay for services offered by a broadcaster or for the viewing of a recorded program. Whichever cash transfer mechanism is employed, the user requests a transfer of a specific amount of money to the CA card from a credit or debit account.

Once money is loaded into the card, a user can buy any number of services offered by broadcasters or, perhaps, may be used to purchase "viewing rights" for the recorded program. Each purchase reduces the amount of available money in the card by the service price. The services offered by broadcasters can be classified into two categories; PPV events and packages. An event is a TV program with an allocated slot in a program guide, and a package is simply a collection of events. Examples of packages are (1) all the football games in a given season, (2) the late Sunday movies on one or more ATSC virtual channels, (3) subscription to a particular virtual channel such as HBO. All events usually have one or more of their audiovisual streams scrambled using a common or shared symmetric key algorithm.

Upon purchase of an event or package, a record may be stored in the smart card which may be later transferred to the CA vendor. Once the stored purchase information is sent to the CA database, the CA vendor can pay broadcasters for the provided services.

The security of the system may be based on standard and widely accepted public key and symmetric key algorithms. For example, suitable algorithms include RSA for public key encryption and triple DES and/or single

DES for symmetric key scrambling. In an exemplary system utilizing these algorithms, there is a global RSA public/private key pair, K_{pub}/K_{pri} , for the entire system. The public key is shared by all the broadcasters, and the corresponding private key is placed in the tamper-proof NRSS-based smart cards, distributed by the CA providers to the consumers. This public key is used to protect the ECMs generated at the head-end. It is within the scope of this invention that a scrambling algorithm may be a cipher other than DES.

Symmetric key cryptography involves the use of the same key for both encryption and decryption. The foundation of public-key cryptography is the use of two related keys, one public and one private. The private key is a secret key, and it is computationally unfeasible to deduce the private key from the public key, which is publicly available. Anyone with a public key can encrypt a message, but only the person or device having the associated and predetermined private key can decrypt it.

A digital home network 10, as depicted in Figure 1, is a cluster of digital audio/visual (A/V) devices including set-top-boxes 12, TVs 14, VCRs 16, DVD players 18 and general-purpose computing devices (not shown) such as personal computers. Several digital interfaces will be available for device interconnection within home networks. For example, EIA-775 DTV 1394 Interface Specification defines a specification for a baseband digital interface to a DTV which is based on the IEEE 1394 Standard for High Performance Serial Bus. The IEEE 1394 serial bus allows digital devices such as televisions, VCRs, DVD players and set-top-boxes to communicate with each other. It provides two types of transport: asynchronous transport for "guaranteed delivery", and the optional isochronous transport for "guaranteed timing." (Isochronous channels are required for multimedia applications.) EIA-761 DTV Remodulator Specification with Enhanced OSD Capability and EIA-762 DTV Remodulator Specification defines minimum specifications for a one-way data path utilizing an 8 VSB and a 16 VSB remodulator, respectively, in compliance with ATSC Standard A/53 Annex D.

The present invention defines a new paradigm for copy protection within a digital home network. This paradigm allows the copying of digital content that may either be broadcast or pre-corded. The copy is checked for legitimacy before display.

Further, as depicted in Figure 1, original copyrighted content is delivered to the home network 10 from a number of sources. It may be

transmitted via satellite 20, terrestrial 22 or cable 24 systems or recorded on a digital tape 26 or a DVD 28. Transmitted or recorded on media, the content can be identified as "never-copy", "copy-once" and "free-copy". These three states are represented using the Copy Generation Management System (CGMS) bits.

- 5 (The CGMS bits are a part of the CCI.) All the A/V devices in the cluster should obey "playback control", "record control" and "one-generation control" rules as summarized below.

Device type \ content type	Never-copy	Copy-once	No-more-copies	Free copy
Player	Play.	Play.	Play.	Play.
Recorder	Do not record	Record and change content type to "no-more-copies" in the new copy.	Do not record.	Record.

- 10 A copy protection system must protect the transmission of the audio/video content from one A/V device to another, and must protect the storage of the audio/video content. The present invention defines solutions to both of these problems by "keeping content scrambled until it is displayed". It allows recording of scrambled content, but prohibits viewing if the content is not
- 15 legitimate (i.e., not an original or a one-generation copy). This is in contrast with the recording rules as defined in the above table.

- Particularly, Figure 1 illustrates a typical home network comprised of various digital audio/video devices capable of receiving digital content (e.g., a
- 20 movie) where the present invention may be employed. The digital content is encoded with MPEG-2 Transport Stream (TS) format and broadcast together with the Entitlement Control Messages (ECMs). An ECM (see Figure 2a) is a cryptogram of the control word (i.e., descrambling key) and the access conditions.

- 25 The STB or DTV receives the scrambled A/V stream from a source (broadcast head-end or player) and transmits it directly to a smart card. The smart card (SC) 30 is inserted into, or coupled to, a smart card reader (not shown); an internal bus interconnects the STB or DTV and the smart card thereby permitting the transfer of data therebetween. Such smart cards include, for
- 30 example, ISO 7816 cards complying with National Renewable Security Standard (NRSS) Part A or PCMCIA cards complying with NRSS Part B. As stated above, this inventive concept is not limited to smart cards per se, but can be employed with any renewable security device. Conceptually, when a smart card is coupled to a smart card reader, the functionality of the smart card may be considered to

be a part of the functionality of the digital television, thus removing the "boundaries" created by the physical card body of the smart card.

The smart card checks if the content is legitimate, recovers the DES keys, and descrambles the stream after checking the entitlement. (An on-screen display message (OSD) prompts the consumer to initiate a purchase offer just before the movie starts.) A subscription entitlement is stored in the card, but an event entitlement is transmitted with the event and used to generate the purchase offer).

Two unique, but related, methods for differentiating copies from an original and then verifying if the copy is legitimate prior to enabling the user to view the copy are defined below. In either method when the scrambled program is to be recorded, the first thing the recording device (e.g., a DVCR or a DVD recorder) does is to verify whether the program is scrambled. This may be achieved by checking for ECMs which are identified by their packet identification (PID) in the packet header. One alternative would be to check the Transport Scrambling Control (TSC) bits in the transport packet header. Another method would be to ascertain whether the program is scrambled as described below. The MPEG video syntax includes byte-aligned 32 bit fields called "start codes" that indicate synchronizing points in the bit stream. For example, there are "picture start codes" (0x 00 00 01 00) at the beginning of each frame in the MPEG video bit stream. These frames can occur at 60, 50, 30, or 24 frames per second (fps). Therefore, a simple test would be to look for picture start codes in the bitstream. If the rate of picture start codes per second is close to one of the possible rates, then it is reasonable to assume that the bit stream is not encrypted.

In one embodiment of the present invention if the content is scrambled, the recorder encrypts the ECMs using the global public key. Before encryption takes place, the recorder attaches a mark (or data item) (see Figure 2b) to each ECM as an indication of copying. In general, every time a scrambled movie is copied, its ECMs are encrypted once again, a process that may be referred to as "nesting". This allows the smartcard to determine how many times the original movie has been copied. The following example (wherein GPK is the Global public key, E is the Encryption process, CW is the Control word (the key for descrambling) and ECM contains CW, CCI, source of the content and other data) detects an illegitimate copy and prevents the display thereof.

Assume an ECM of the movie has the form: $E_{GPK}(CW, \text{never-copy})$.
If a recorder receives this ECM, it will transform it to: $E_{GPK}[E_{GPK}(CW, \text{never-copy})]$,

copy-mark)). The movie with this nested ECM will be the output of the recording process. When a user attempts to view it, the smart card will detect that it is a copy of a "never-copy" content and will not allow display. If the movie is a "copy-once" content, the ECM will be in the form: $E_{GPK} [E_{GPK}(CW, \text{copy-once}), \text{copy-mark}]$ in the copy. This is an indication of a legitimate copy and the smart card will allow viewing. However, if a copy of a copy is created, the ECM will have two layers of nesting, for example, $[E_{GPK} \{E_{GPK} [E_{GPK}(CW, \text{copy-once}), \text{copy-mark}]]$, and the copy will be detected to be illegitimate.

One way to increase the security of the copy protection system is to use a local public key for recording purposes. This requires a smart card with a unique public/private key pair. For copying a movie, the smart card is coupled to the VCR and provides the public key. The public key is then used to encrypt the ECMs to create a copy that can be played only with the corresponding unique private key.

Another option to increase the security of the system is to attach a unique recorder ID together with the copy-mark during the ECM nesting process. This additional information creates a binding between the copy and the recorder. Further, both the recorder and the smart card would have the same recorder ID. Therefore, viewing of the copy would only be possible with the smart card having the recorder ID.

Every copyrighted (and encrypted) digital content shall be available to be copied on any recorder. The created copy, if legitimate, can then be viewed according to the rules of an established payment system. If, for example, a DTV receives a scrambled program without a nested ECM, then the DTV would treat the program as if it was an original scrambled program and not a copy. That is, the DTV would allow the program to be viewed. However, if the user wished to make a copy of the "original program", then the ECM and a data item would together be encrypted in accordance with the present invention.

In an alternate embodiment of the present invention, the ECMs are extended to contain the CGMS bits and access rights as well as control words. Every time copyrighted content (e.g., a movie) is recorded, the extended ECMs (XECMs) are modified through a one-way, irreversible transformation (for example, hashing) to distinguish copies from the original. A function f from a set X to a set Y is called a *one-way function* if $f(x)$ is easy to compute for all $x \in X$ but for essentially all $y \in \text{Im}(f)$, it is computationally infeasible to find any $x \in X$ such that $f(x) = y$.

When the smart card receives the XECMs, it processes them depending on the type of the system. Two functionally distinct systems can be accommodated within this architecture: Conditional Access (CA) systems and Copy Protection (CP) systems.

(i) CA system: The smart card is a component of a CA system. Before viewing is allowed, the smart card checks how many times the XECMs are modified and responds according to the pre-defined rules of the CA system.

(ii) CP system: The smart card is a component of a CP system. The functionality of the smart card is limited. It checks the legitimacy of the content and prevents the viewing of illegitimate copies.

The processing of XECMs will be explained using the following example and referring to Figures 2C and 3. Assume a movie is being copied on a DVCR. Its XECM syntax is defined to be $XECM = E_K(CW, D/T, \text{content type}, x_0), x_i$, where $x_0 = x_1$, $x_{i+1} = f(x_i)$ for $i > 0$ and E is the encryption process, K is the encryption key, CW is the control word, D/T is the date and time stamp, x_0 is a random number, and f is a one-way function.

(a) Content type is "never-copy":

Recorder input: $E_K(CW, D/T, \text{"never-copy"}, x_0), x_1$

Recorder output: $E_K(CW, D/T, \text{"never-copy"}, x_0), x_2$

When the user attempts to view the copy, the card will, after decrypting the XECM, compare x_0 and x_2 . If they are not equal, display will not be allowed.

(b) Content type is "copy-once":

Recorder input: $E_K(CW, D/T, \text{"copy-once"}, x_0), x_1$

Recorder output: $E_K(CW, D/T, \text{"copy-once"}, x_0), x_2$

This time the comparison of x_0 and x_2 will reveal that the copy is legitimate. If, however, the 1st generation copy is the input to the recorder, the output will be illegitimate since $f(f(x_0)) = x_3$. Note that the XECMs are modified without consideration of the number of modifications already made.

In CA systems, the D/T stamp field allows detection of copies made by a pirated recorder. When a card detects an "old" XECM that has not been modified, it will consider it to be a pirate copy. In CP systems, the D/T stamp can be used to assign limited lifetime to prerecorded media and authorized copies made from them.

A very important feature of the "XECM modification" scheme is that it gives the content distributors (broadcasters and publishers) complete freedom in choosing their encryption algorithm for creating the XECMs. Hence, although
5 the copy protection system is constructed as an extension of the CA systems, it is "decoupled". The only requirement is to use the common structure for the XECM.

As described below, the XECM originating at the content source has two sections: Private and Mandatory. The Private section contains fields that are
10 privately defined by the operators of CA and CP systems. The Mandatory section contains three fields that must be included in all XECMs.

The fields in the Private section of the XECM include: XECM_id (Unique identifier for the Extended Entitlement Control Message), XECM_length
15 (an 8-bit field specifying the number of bytes in the XECM), format_identifier (a 32-bit field that identifies the registration authority that assigns values to the provider_index field), provider_index (a 16-bit field that identifies the content provider), program_event_id (a 24-bit field that identifies a particular TV program or event), transport_stream_id (a 16-bit field that identifies the Transport Stream
20 where the event is being carried), source_id (a 16-bit field that identifies uniquely the particular service where the event is being transmitted), event_id (a 14-bit field that identifies uniquely a particular event within a given service of this Transport Stream), start_time (a 32-bit field indicating the event start time), length_in_seconds (a 20-bit field indicating the length of the event), title_segment
25 (the first 10 characters of the English title for the event that this message describes), event_price (a BCD field which indicates the cost of the event), scrambling_key (a 64-bit key necessary for de-scrambling the video and audio signals for the event under consideration), descriptors_length (the total length of the descriptor list that follows the descriptors). The Mandatory section of the
30 XECM include: CCI — Copy Control Information (CGMS bits, APS trigger bits and Digital Source bit), copy_indicator_initial_value (a random bit sequence) and copy_indicator (a bit sequence equal to copy_indicator_initial_value).

DTV 14 is the final destination of the digital content 40 for viewing.
35 It receives the scrambled A/V stream from a source (broadcast/cable head-end, satellite, cable STB, DBS STB or playback device) and transmits it directly to the smart card 30. Smart card 30 checks if the content is legitimate. For example, if it receives a broadcast PPV movie, an OSD prompts the consumer to initiate a purchase offer before the movie starts. If the movie is purchased, a record is
40 stored in the card. The card then recovers the scrambling keys and descrambles

the stream. The information about the event (price, start time, length, etc.) contained in the XECMs is used to generate the purchase offer. Finally, DTV 14 outputs the same stream it receives.

5 If a movie is to be recorded, the DVCR detects and modifies the XECMs. In addition, the Transport Scrambling Control (TSC) bits in the transport packet header can be checked to see if the content is scrambled. If the content is not scrambled, it is copied as is. In general, every time a scrambled movie is copied, its XECMs are modified once again. This allows the
10 smart card to determine how many times the original movie has been copied. Optionally, the XECM modification functionality can be assigned to a smart card inserted to the recorder. In this case, the recorder needs to have a smart card reader.

15 While the invention has been described in detail with respect to numerous embodiments thereof, it will be apparent that upon reading and understanding of the foregoing, numerous alterations to the described embodiment will occur to those skilled in the art and it is intended to include such alterations within the scope of the appended claims.

Claims

1. A method for copying a program having a scrambled program content component and an encrypted control component comprising:
 - 5 (a) receiving, in a recording apparatus, said program;
 - (b) attaching a data item to said encrypted control component, said data item indicating that said program has been copied;
 - (c) encrypting said encrypted control component and said data item to generate a nested control component; and
 - 10 (d) recording said program content component and said nested control component.
2. The method of Claim 1 wherein the steps of receiving, attaching and
15 encrypting are performed in a smart card coupled to said recording apparatus.
3. The method of Claim 2 wherein said encrypted control component comprises copy control information, a descrambling key associated with said scrambled program content component.
20
4. The method of Claim 3 wherein said copy control information indicates one of never-copy state and copy-once state.
5. The method of Claim 4 wherein said encrypted control component is
25 encrypted using a global public key.
6. The method of Claim 5 wherein said nested control component is encrypted using said global public key.

7. The method of Claim 6 wherein said global public key is associated with said smart card, said smart card having a corresponding private key stored therein.
- 5 8. The method of Claim 7 wherein said encrypted control component further comprises purchase information comprising channel identification data, event identity data, date and time stamp data, and billing data.
- 10 9. The method of Claim 8 wherein said smart card comprises a card body with a plurality of terminals arranged on a surface of said card body in accordance with one of ISO 7816 and PCMCIA card standards.
10. The method of Claim 9 wherein said recording apparatus is a digital video cassette recorder.
- 15 11. The method of Claim 10 wherein said recording apparatus is a recordable DVD apparatus.
- 20 12. A method for managing access to a copy of a restricted program, said method comprising:
- 25 (a) receiving said restricted program in a processing apparatus, said restricted program having a scrambled program content component and a nested control component, said nested control component being encrypted;
- (b) decrypting said nested control component to obtain an encrypted control component and a data item, said data item indicating that said restricted program has been copied;
- (c) decrypting said encrypted control component to obtain a descrambling key and copy control information;

- (d) comparing said copy control information and said data item to determine if said copy is valid; and
- (e) descrambling said program content component, using said descrambling key in response to a determination that said copy is valid.

5

13. The method of Claim 12 wherein said encrypted control component and said nested control component are encrypted using a global public key.

10 14. The method of Claim 13 wherein the steps of receiving, decrypting, comparing and descrambling are performed in a smart card coupled to said processing apparatus, said steps of decrypting employ a private key stored in said smart card and associated with said global public key.

15 15. The method of Claim 14 wherein said encrypted control component further comprises purchase information comprising channel identification data, event identity data, date and time stamp data, and billing data.

20 16. The method of Claim 15 wherein said purchase information comprises the cost of said program, said method further comprising:

- (a) deducting the cost of said program from a cash reserve stored in said smart card to determine a calculated cash reserve;
- (b) descrambling, in said smart card, said scrambled program content component using said descrambling key in response to having a positive calculated cash reserve; and
- (c) passing said descrambled transmitted event to said video processing apparatus.

25

30 17. The method of Claim 16 wherein said cash reserve is downloaded in an e-cash certificate message from an automatic teller machine.

18. The method of Claim 17 wherein said processing apparatus is one of a digital video cassette recorder/player and a DVD recorder/player.

5 19. The method of Claim 18 wherein said smart card comprises a card body with a plurality of terminals arranged on a surface of said card body in accordance with one of ISO 7816 and PCMCIA card standards.

20. A method for managing access to a recorded copy of a restricted program
10 using a smart card coupled to a video processing apparatus comprises:

- (a) transferring, from a bank, a cash reserve to said smart card;
- (b) receiving, in said smart card, said recorded copy of said restricted program from said video processing apparatus, said restricted program having a scrambled audio/video component and a nested control component, said nested control component being encrypted;
- 15 (c) decrypting said nested control component to obtain an encrypted control component and a data item, said data item indicating that said restricted program has been copied;
- (d) decrypting said encrypted control component to obtain a
20 descrambling key, copy control information and purchase information;
- (e) comparing said copy control information and said data item to determine if said copy is valid;
- (f) verifying that the cost of said restricted program is less than the
25 stored cash reserve and deducting the cost of said restricted program from said stored cash reserve;
- (g) descrambling said audio/video component, using said descrambling key.

1/3

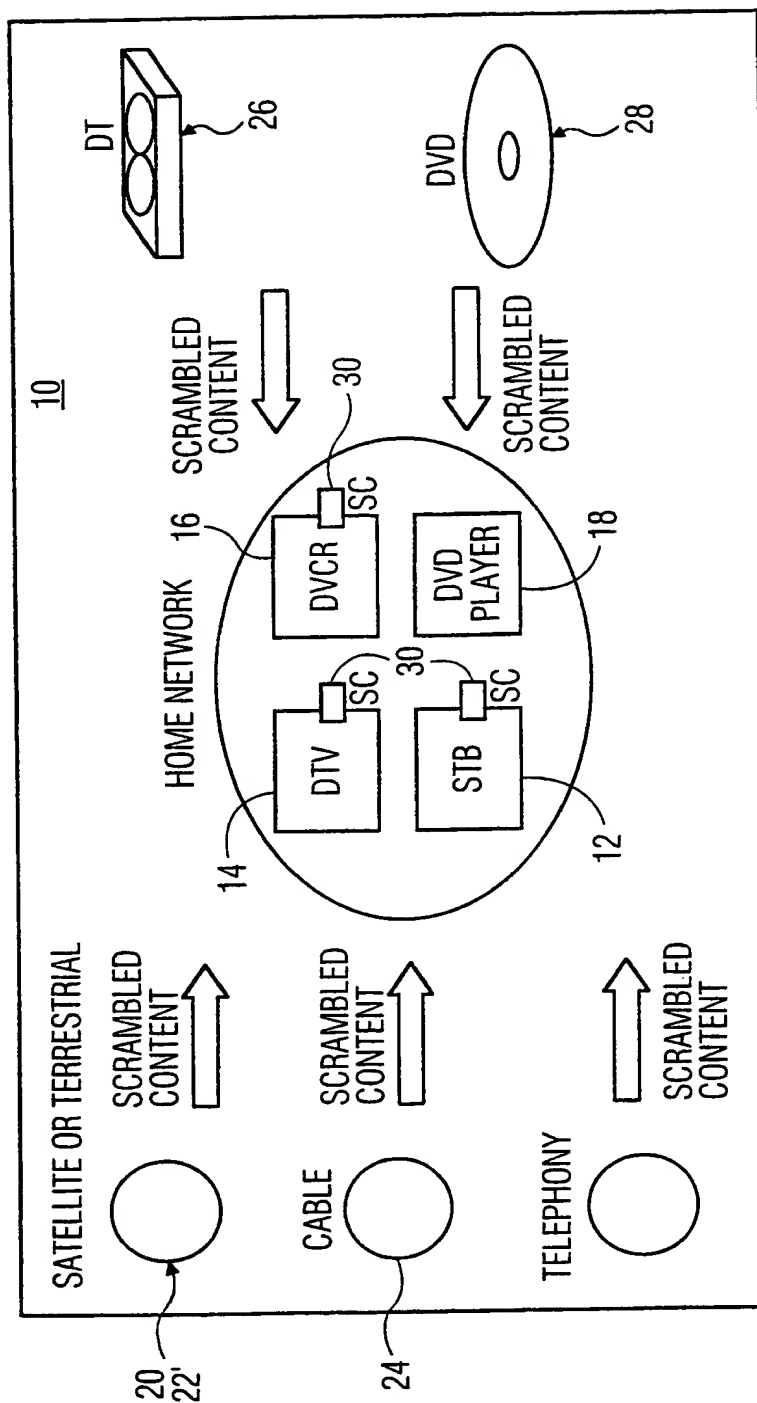


FIG. 1

2/3

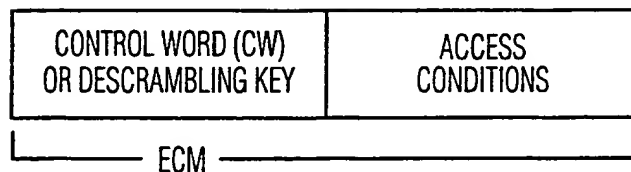


FIG. 2A

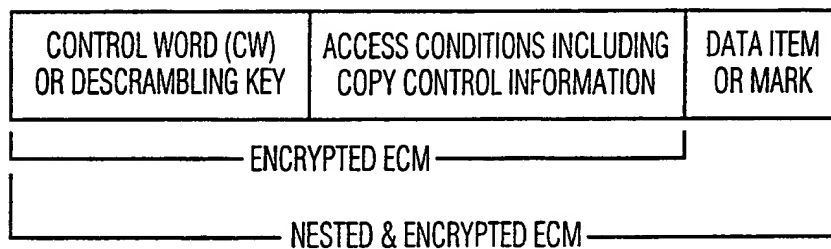


FIG. 2B

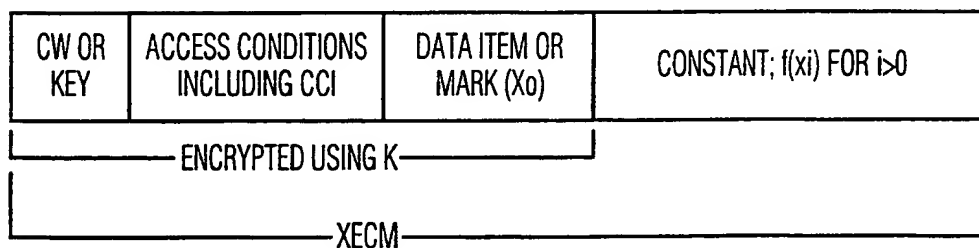


FIG. 2C

3/3

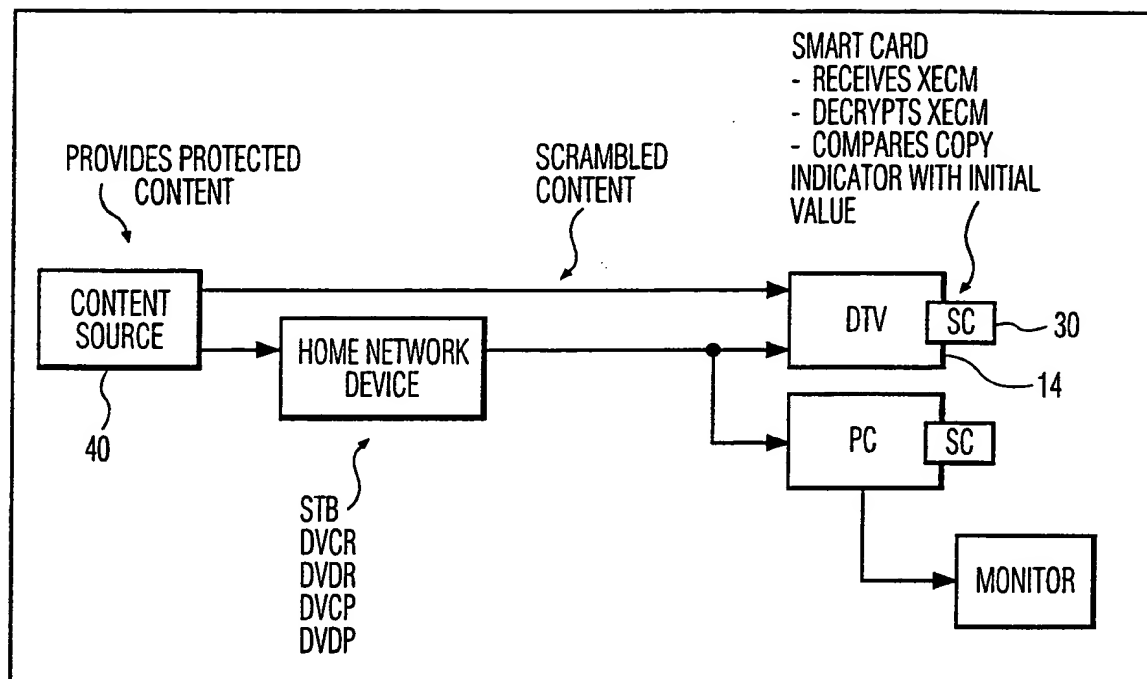


FIG. 3

INTERNATIONAL SEARCH REPORT

Internat. Application No.

PCT/US 99/19700

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04N5/913 H04N7/167 H04N7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	EP 0 912 052 A (CANAL PLUS SA) 28 April 1999 (1999-04-28) the whole document	1-20
X	EP 0 763 936 A (LG ELECTRONICS INC) 19 March 1997 (1997-03-19) the whole document	1-20
X	EP 0 714 204 A (LG ELECTRONICS INC) 29 May 1996 (1996-05-29) the whole document	1-20
A	WO 97 25816 A (SONY CORP ;INOUE HAJIME (US); LEE CHUEN CHIEN (US); SONY ELECTRONI) 17 July 1997 (1997-07-17) the whole document	1, 12
	— -/-	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"Z" document member of the same patent family

Date of the actual completion of the international search

11 February 2000

Date of mailing of the international search report

18/02/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Giannotti, P

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US 99/19700

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"FUNCTIONAL MODEL OF A CONDITIONAL ACCESS SYSTEM" EBU REVIEW- TECHNICAL, BE, EUROPEAN BROADCASTING UNION. BRUSSELS, no. 266, 21 December 1995 (1995-12-21), pages 64-77, XP000559450 ISSN: 0251-0936	
A	EP 0 858 184 A (NDS LTD) 12 August 1998 (1998-08-12)	
A	FR 2 732 537 A (CANAL PLUS SA) 4 October 1996 (1996-10-04)	
A	EP 0 860 823 A (TOKYO SHIBAURA ELECTRIC CO) 26 August 1998 (1998-08-26)	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/19700

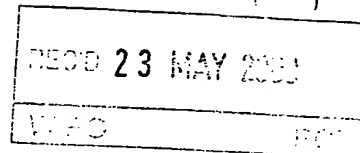
Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0912052 A	28-04-1999	AU 9092698 A WO 9916244 A	12-04-1999 01-04-1999
EP 0763936 A	19-03-1997	CN 1150738 A JP 9093561 A US 5799081 A	28-05-1997 04-04-1997 25-08-1998
EP 0714204 A	29-05-1996	CN 1137723 A JP 8242438 A US 5757909 A	11-12-1996 17-09-1996 26-05-1998
WO 9725816 A	17-07-1997	AU 1344097 A CN 1209247 A EP 0882357 A US 5889919 A	01-08-1997 24-02-1999 09-12-1998 30-03-1999
EP 0858184 A	12-08-1998	GB 2322030 A, B	12-08-1998
FR 2732537 A	04-10-1996	NONE	
EP 0860823 A	26-08-1998	US 5987126 A WO 9802881 A	16-11-1999 22-01-1998

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference RCA89181		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US99/19700	International filing date (day/month/year) 31/08/1999	Priority date (day/month/year) 31/08/1998
International Patent Classification (IPC) or national classification and IPC H04N5/913		
Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 30/03/2000	Date of completion of this report 19.05.2000
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Loeser, E Telephone No. +49 89 2399 8482 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/19700

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-12 as originally filed

Claims, No.:

1-20 as originally filed

Drawings, sheets:

1-3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/19700

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-20
	No: Claims
Inventive step (IS)	Yes: Claims 1-20
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-20
	No: Claims

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/19700

1. Concerning Section V - Articles 33(2) and 33(3) PCT

The following documents are cited:

- D1: EP-A-0 912 952;
- D2: EP-A-0 763 936;
- D3: EP-A-0 714 204;
- D4: EP-A-0 858 184;
- D5: FR-A-2 732 537.

D1 discloses recording of encrypted digital data, wherein scrambled data accompanied by an encrypted control word is received, the control word is decrypted and re-encrypted to a different control word.

In the context of digital video recording, D2 (Figs. 10, 11 and related text passages) discloses reception of scrambled data accompanied by encrypted control information, decrypting and modifying the control information, and re-encrypting the modified control information.

In the same context, D3 (abstract) discloses reception of a scrambled bitstream accompanied by an encrypted keystream, wherein in a recording mode the keystream is accordingly modified and recorded in an encrypted format mixed with the bitstream.

D4 (abstract) discloses replacing an entitlement control message (ECM) received along with scrambled digital data with a transformed entitlement control message.

D5 also discloses re-encrypting control information received along with digital video data.

2.1. Claim 1

None of the presently available documents appears to disclose

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/19700

features (b) and (c) of claim 1 on file, which features pertain to attaching a data item indicative of a copy status of a program to a received encrypted control component, whereafter encryption is applied to the encrypted control component with the data item attached to generate a nested control component. Accordingly, claim 1 meets the requirements of novelty and inventive step set out in Articles 33(2) and 33(3) PCT.

2.2. Claims 12, 20

Claims 12 and 20 provide the inverse of the method defined in claim 1 and thus are linked to the novel and inventive concept of claim 1. Accordingly, claims 12 and 20 meet the requirements of novelty and inventive step set out in Articles 33(2) and 33(3) PCT.

3. Concerning Section VII: Description and formal belongings

a)

The additional subject-matter provided by claims 8 and 19 pertains to features of an apparatus rather than to method steps. Accordingly, doubt is cast upon the claims' intended scope of protection, contrary to the requirements set out in Art. 6 PCT.

b)

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 to D5 identified above is not mentioned in the description, nor are these documents identified therein.